

ZWEIBRUCKEN AF, GERMANY

Latitude = 49.22 N

Longitude = 7.40 E

Period of Record = 1962 to 1991

WMO No. 107140

Elevation = 1132 feet

Average Pressure = 28.78 inches Hg

Design Criteria Data

	Design Value	Mean Coincident (Average) Values			
		Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Dry Bulb Temperature (T)	(°F)				
Median of Extreme Highs	86	67	75	6.5	SW
0.4% Occurrence	83	67	77	6.0	E
1.0% Occurrence	81	66	75	5.9	E
2.0% Occurrence	77	64	72	6.5	W
Mean Daily Range	12	-	-	-	-
97.5% Occurrence	23	21	14	7.1	NE
99.0% Occurrence	18	17	11	6.5	NE
99.6% Occurrence	14	13	9	7.6	NE
Median of Extreme Lows	12	11	8	7.1	NE
	Design Value	Mean Coincident (Average) Values			
		Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Wet Bulb Temperature (T_{wb})	(°F)				
Median of Extreme Highs	71	82	98	5.5	E
0.4% Occurrence	69	80	90	5.8	VARIABLE
1.0% Occurrence	67	77	84	5.7	W
2.0% Occurrence	65	74	80	5.7	W
	Design Value	Mean Coincident (Average) Values			
		Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Humidity Ratio (HR)	(gr/lb)				
Median of Extreme Highs	107	79	0.69	5.4	WSW
0.4% Occurrence	95	73	0.61	4.8	W
1.0% Occurrence	88	72	0.57	5.1	W
2.0% Occurrence	83	70	0.54	5.6	W
Air Conditioning/ Humid Area Criteria	# of Hours	T ≥ 93°F	T ≥ 80°F	T _{wb} ≥ 73°F	T _{wb} ≥ 67°F
		1	97	4	103

Other Site Data

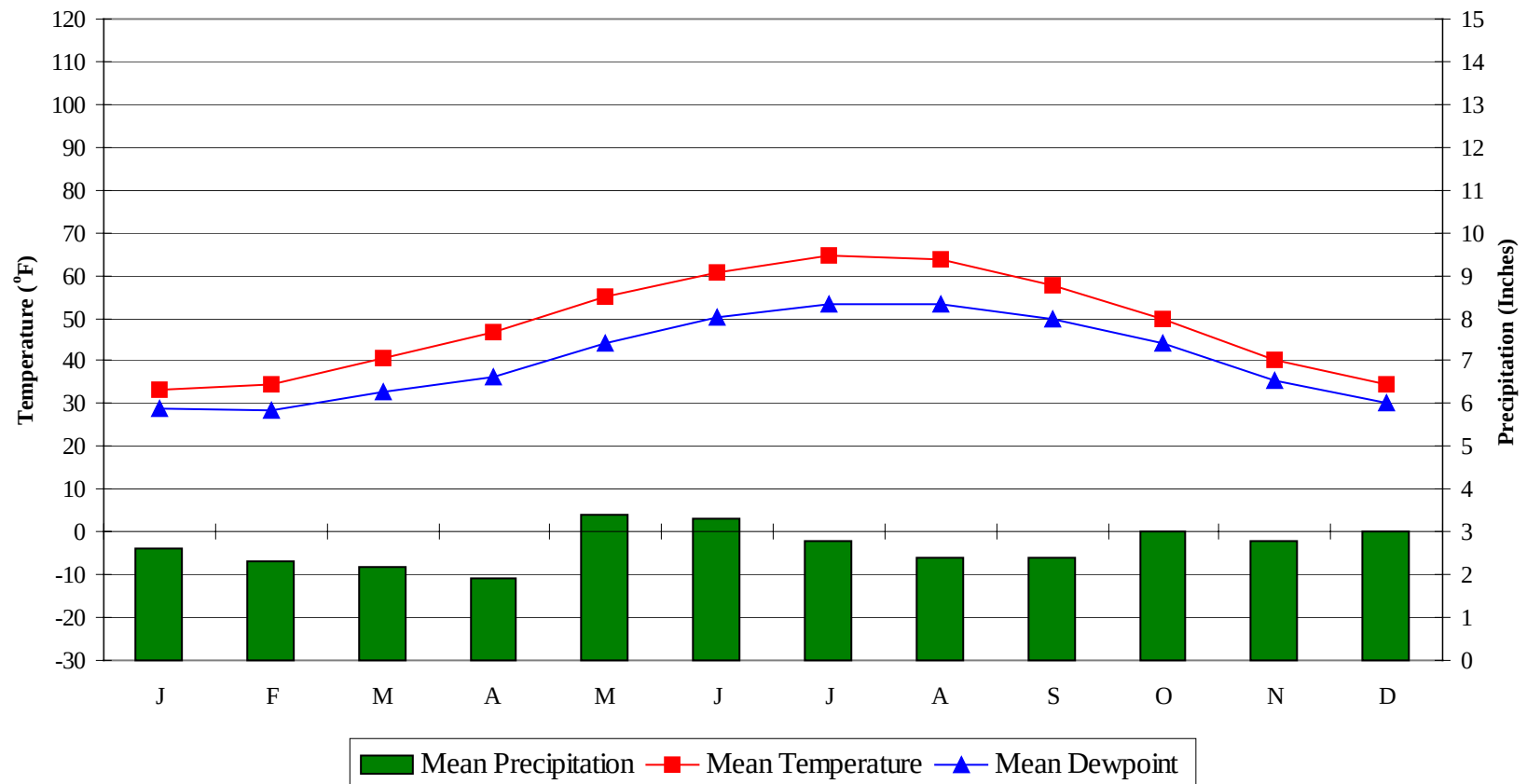
Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
6	N/A	N/A	0.1 + 0.1
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft ²)	Average Annual Freeze-Thaw Cycles (#)
50.7	N/A	N/A	36

*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

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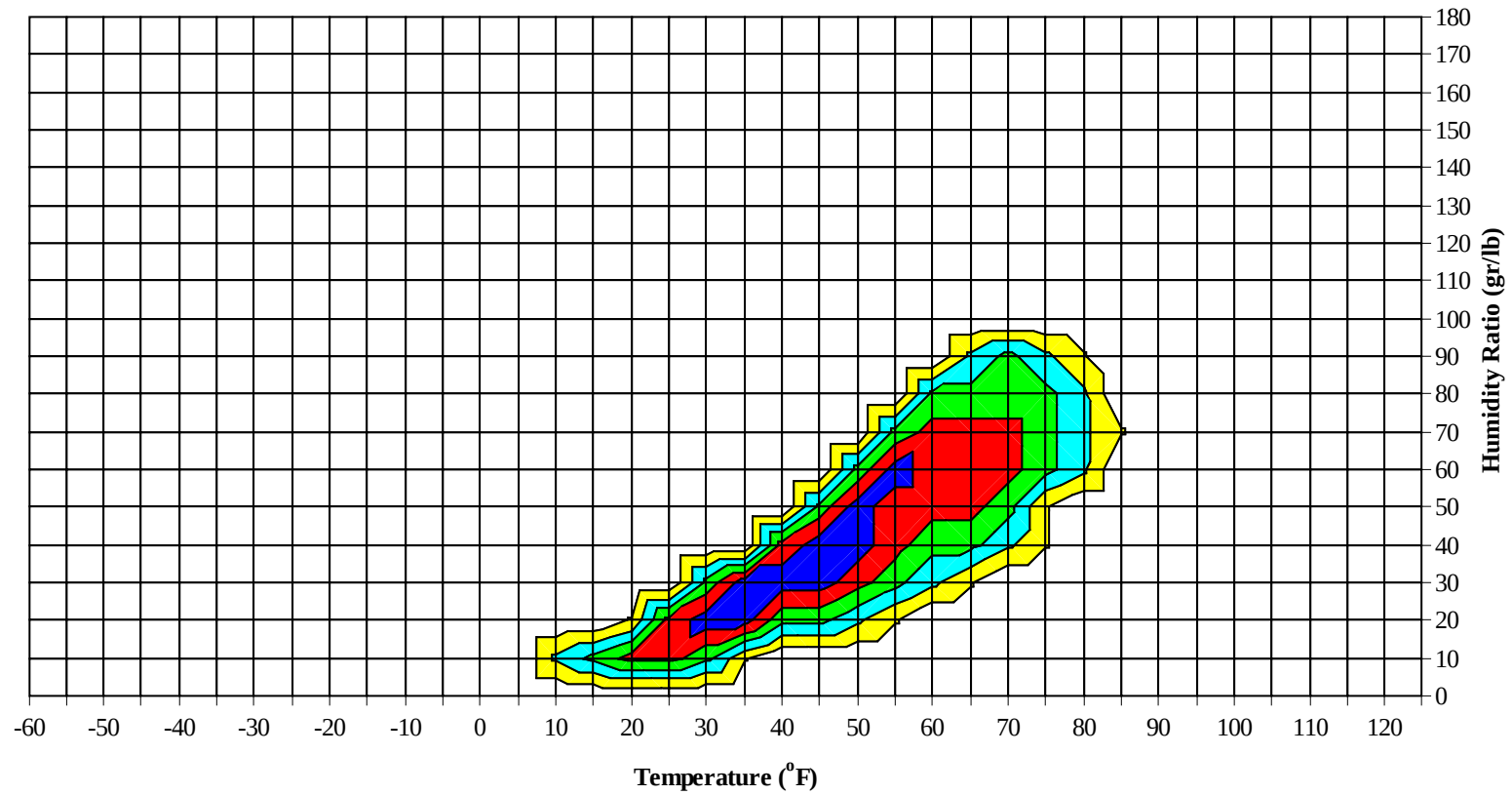
Average Annual Climate



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Long Term Psychrometric Summary

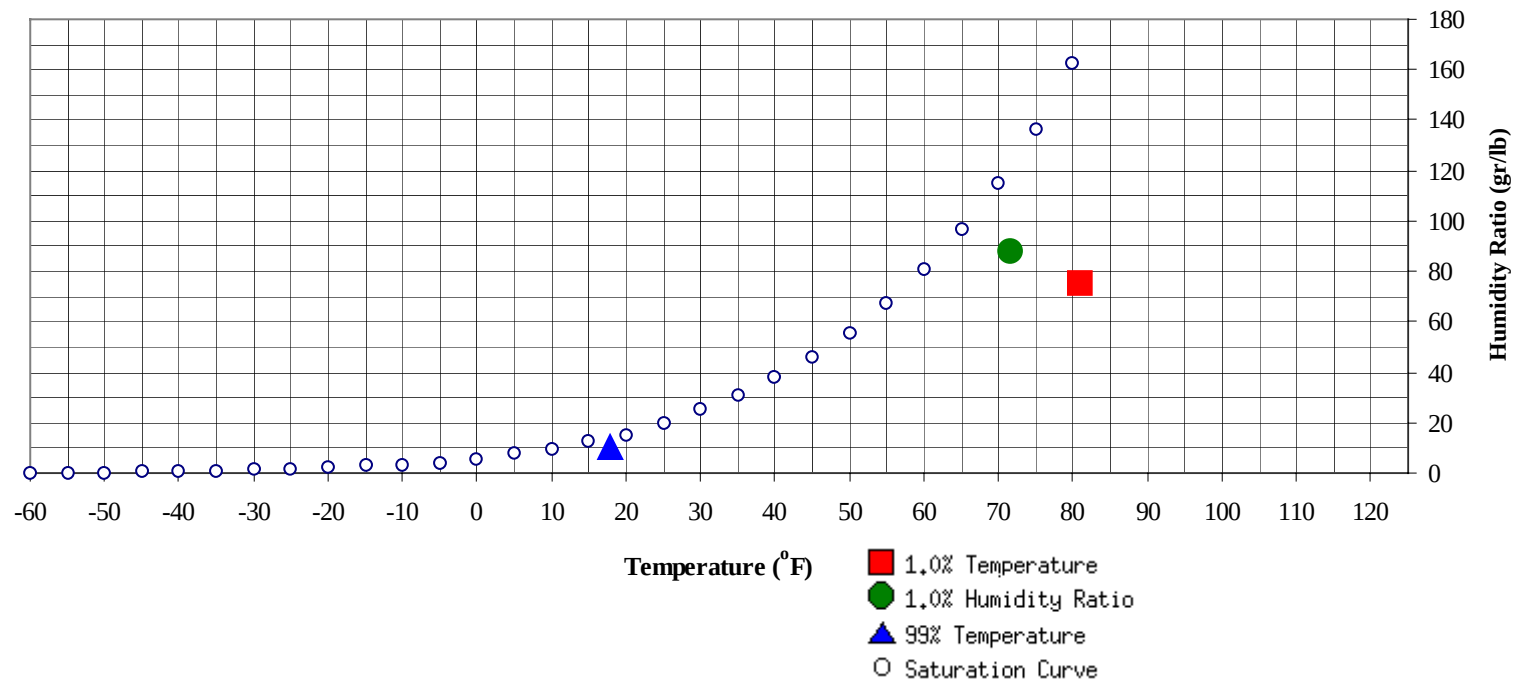


- 50% of all observations
- 80% of all observations
- 95% of all observations
- 97.5% of all observations
- 99% of all observations

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Psychrometric Summary of Peak Design Values



	(°F)	MCHR	Enthalpy	1.0% Humidity Ratio	(gr/lb)	MCDB	MCWB	MC Dewpt	Enthalpy
		(gr/lb)	(btu/lb)			(°F)	(°F)	(°F)	(btu/lb)
99% Dry Bulb	18	10.5	5.9	Ratio	88.2	71.7	65.6	62.6	31.0

1.0% Dry Bulb	(°F)	MCHR	MCWB	Enthalpy
		(gr/lb)	(°F)	(btu/lb)
81	75.4	66	31.3	

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Dry-Bulb Temperature Hours For An Average Year (Sheet 1 of 5)

Period of Record = 1962 to 1991

Temperature Range (°F)	January					February					March				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
95 / 99															
90 / 94															
85 / 89															
80 / 84															
75 / 79															
70 / 74												1	0	1	55.5
65 / 69												1	1	2	53.2
60 / 64							0	0	0	53.0		6	4	10	51.6
55 / 59		0		0	50.0	0	2	1	3	48.7	1	12	9	22	48.7
50 / 54	1	4	3	8	47.2	3	9	6	19	46.5	9	29	24	62	46.2
45 / 49	17	22	23	63	43.7	15	24	22	62	43.0	37	58	57	152	42.6
40 / 44	32	34	35	101	40.1	23	30	31	84	39.6	40	49	53	142	38.8
35 / 39	57	61	66	185	35.4	45	56	58	159	34.7	71	55	57	182	34.6
30 / 34	65	64	58	187	30.6	64	55	62	181	30.0	54	28	33	114	29.9
25 / 29	34	32	32	97	25.6	46	33	30	108	25.0	28	8	8	44	25.2
20 / 24	16	13	15	44	20.5	16	9	8	34	20.4	8	2	1	10	20.7
15 / 19	13	11	9	34	16.2	8	4	4	16	15.9	2	0	0	2	16.7
10 / 14	8	6	5	19	11.0	4	2	1	7	10.8	0	0		0	12.1
5 / 9	4	2	1	7	6.6	0	0		0	8.0					
0 / 4	0	0		0	2.5										

Caution: This summary reflects the typical distribution of temperature in a typical year. It does not reflect the typical moisture distribution. Because wet bulb temperatures are averaged, this summary understates the annual moisture load. For accurate moisture load data, see the long-term humidity summary and the ventilation and infiltration load pages in this manual.

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Dry-Bulb Temperature Hours For An Average Year (Sheet 2 of 5)

Period of Record = 1962 to 1991

Temperature Range (°F)	April					May					June				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
95 / 99															
90 / 94												0	0	0	68.9
85 / 89												2	1	3	67.6
80 / 84							1	1	2	61.9		8	6	14	66.1
75 / 79		0	0	0	58.6		8	5	14	61.0		0	21	15	36
70 / 74		3	2	5	56.5	0	22	15	37	58.7	2	38	29	69	61.3
65 / 69	0	8	8	16	53.5	1	24	20	45	56.3	9	34	32	76	58.9
60 / 64	1	23	16	40	51.2	10	49	45	105	53.9	38	60	62	160	56.3
55 / 59	6	33	30	70	48.6	37	57	58	153	51.0	71	48	55	174	53.0
50 / 54	26	49	50	124	46.2	68	48	57	174	47.9	76	25	32	133	49.3
45 / 49	60	58	60	178	42.4	77	32	35	144	44.1	38	4	8	50	44.8
40 / 44	48	36	40	124	38.6	35	5	8	48	40.1	5	0	0	5	40.0
35 / 39	63	26	29	118	35.0	17	2	3	22	36.2	1			1	36.0
30 / 34	32	5	5	42	30.6	2		0	2	32.3					
25 / 29	4	0	0	4	26.4										
20 / 24															
15 / 19															
10 / 14															
5 / 9															
0 / 4															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 3 of 5)

Period of Record = 1962 to 1991

Temperature Range (°F)	July					August					September				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
95 / 99		0		0	73.0		0		0	73.0					
90 / 94		3	1	4	69.1		1	0	1	68.0					
85 / 89		4	4	9	67.8		3	2	5	68.0					
80 / 84		21	15	36	66.6	0	15	8	22	67.0		2	1	3	66.3
75 / 79	1	32	29	62	64.4	0	29	20	48	64.5		10	4	14	64.6
70 / 74	10	49	44	102	61.8	5	50	46	102	62.1	0	30	17	47	62.1
65 / 69	20	38	40	98	59.6	14	43	44	101	59.6	3	28	23	55	59.6
60 / 64	61	57	60	178	57.1	63	62	72	197	57.4	28	62	55	145	56.9
55 / 59	87	34	42	163	53.7	92	37	44	174	53.9	56	62	66	185	53.2
50 / 54	56	10	12	78	50.0	57	7	11	75	50.2	83	36	55	174	49.3
45 / 49	13	0	1	14	45.7	15	1	1	17	45.6	51	10	16	76	44.9
40 / 44	0			0	41.5	1			1	42.0	17	1	1	19	40.8
35 / 39											2	0	0	2	37.1
30 / 34															
25 / 29															
20 / 24															
15 / 19															
10 / 14															
5 / 9															
0 / 4															

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Dry-Bulb Temperature Hours For An Average Year (Sheet 4 of 5)

Period of Record = 1962 to 1991

Temperature Range (°F)	October					November					December				
	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	Hour Group (LST)			Total Obs	M C W B (°F)
	01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00			01 To 08	09 To 16	17 To 00		
95 / 99															
90 / 94															
85 / 89															
80 / 84															
75 / 79		1	0	1	63.4										
70 / 74		6	2	8	61.3										
65 / 69	0	8	6	14	59.2										
60 / 64	5	27	20	53	56.4	0	2	1	3	54.0		0		0	53.0
55 / 59	29	51	45	125	52.8	2	10	5	17	51.9	0	2	0	2	50.4
50 / 54	57	68	67	192	48.8	16	27	22	66	48.2	4	6	6	17	48.2
45 / 49	64	50	61	175	44.1	39	53	47	140	43.8	21	29	22	72	44.1
40 / 44	45	22	29	96	40.2	43	43	49	135	39.9	26	31	32	89	39.7
35 / 39	36	12	16	63	36.2	61	59	64	184	35.4	61	67	67	196	35.2
30 / 34	12	2	2	16	31.5	51	35	37	122	30.9	64	63	66	193	30.6
25 / 29	0	0	0	0	26.8	23	11	13	46	25.8	38	32	31	101	25.5
20 / 24						3	1	1	5	20.8	18	11	14	43	20.8
15 / 19						1	0	0	1	17.1	11	5	6	23	16.5
10 / 14						0	0		0	12.3	3	2	2	7	11.6
5 / 9											1	0	0	1	7.2
0 / 4											0	0		0	2.0

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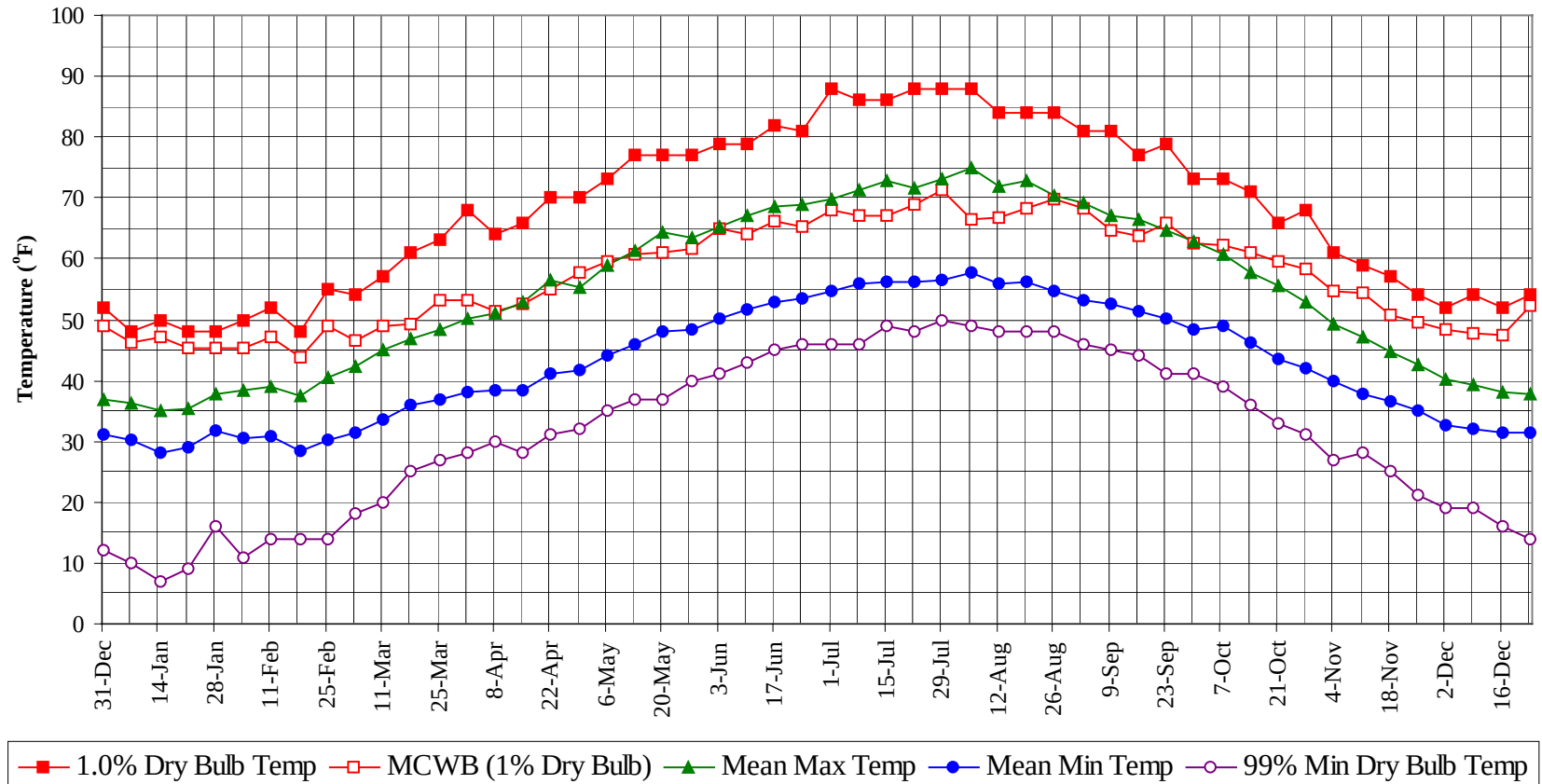
Dry-Bulb Temperature Hours For An Average Year (Sheet 5 of 5)

Period of Record = 1962 to 1991

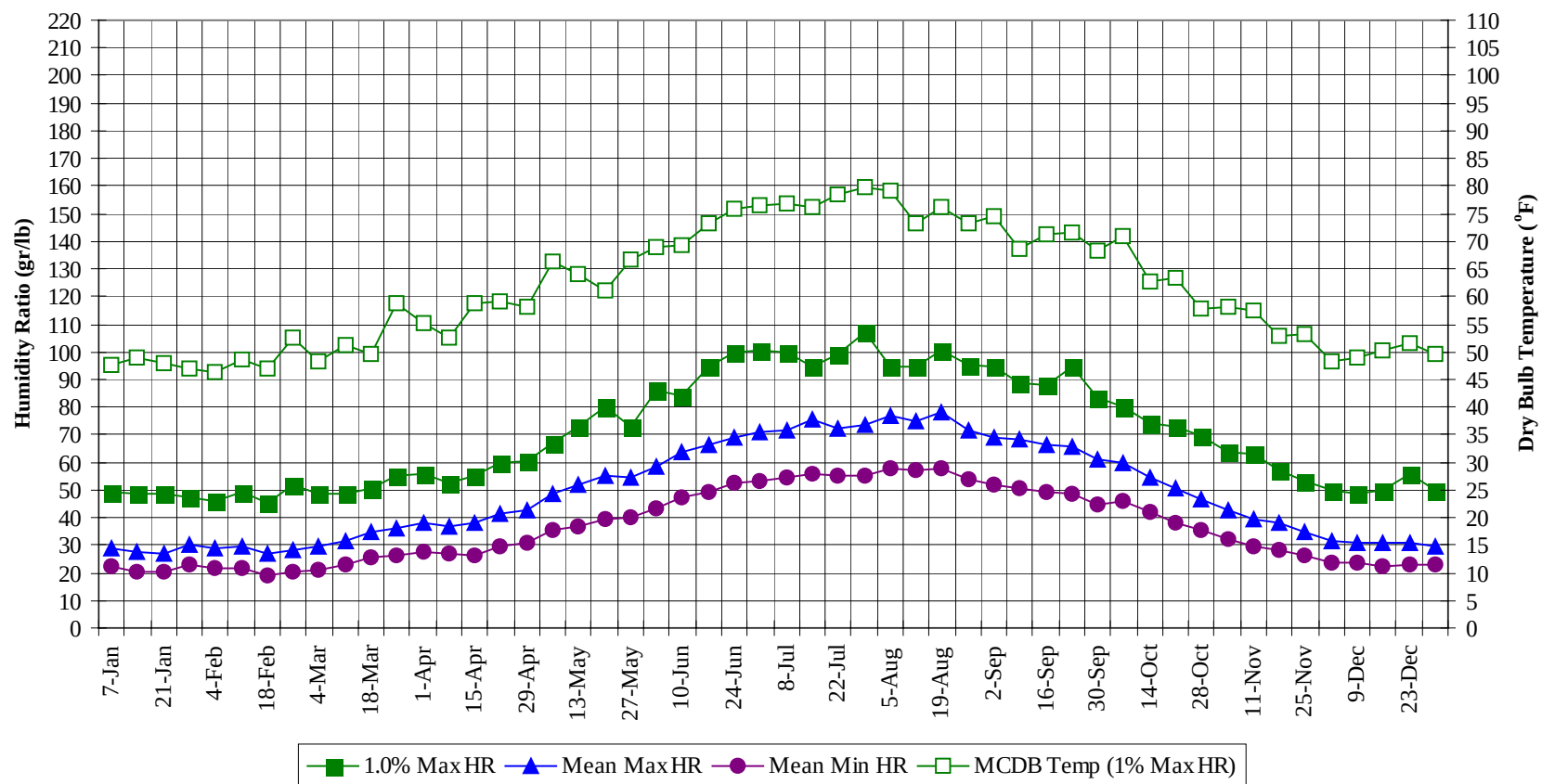
Annual Totals						
Temperature Range (°F)	Hour Group (LST)			Total Obs	M C W B (°F)	
	01 To 08	09 To 16	17 To 00			
95 / 99	0			0	73.0	
90 / 94	4			1	5	68.8
85 / 89	9			6	15	67.8
80 / 84	0	43	28	71	66.5	
75 / 79	1	95	66	162	64.0	
70 / 74	16	190	144	350	61.3	
65 / 69	46	176	163	385	58.8	
60 / 64	197	338	320	854	56.2	
55 / 59	366	344	347	1057	52.5	
50 / 54	449	317	350	1116	48.4	
45 / 49	451	349	365	1165	43.6	
40 / 44	324	260	290	873	39.5	
35 / 39	423	346	377	1145	35.2	
30 / 34	350	258	274	882	30.4	
25 / 29	176	120	119	415	25.4	
20 / 24	62	38	40	140	20.6	
15 / 19	36	23	20	80	16.2	
10 / 14	17	11	10	37	11.1	
5 / 9	5	2	1	8	6.8	
0 / 4	0	0		0	2.3	

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Annual Summary of Temperatures



Long Term Humidity and Dry Bulb Temperature Summary

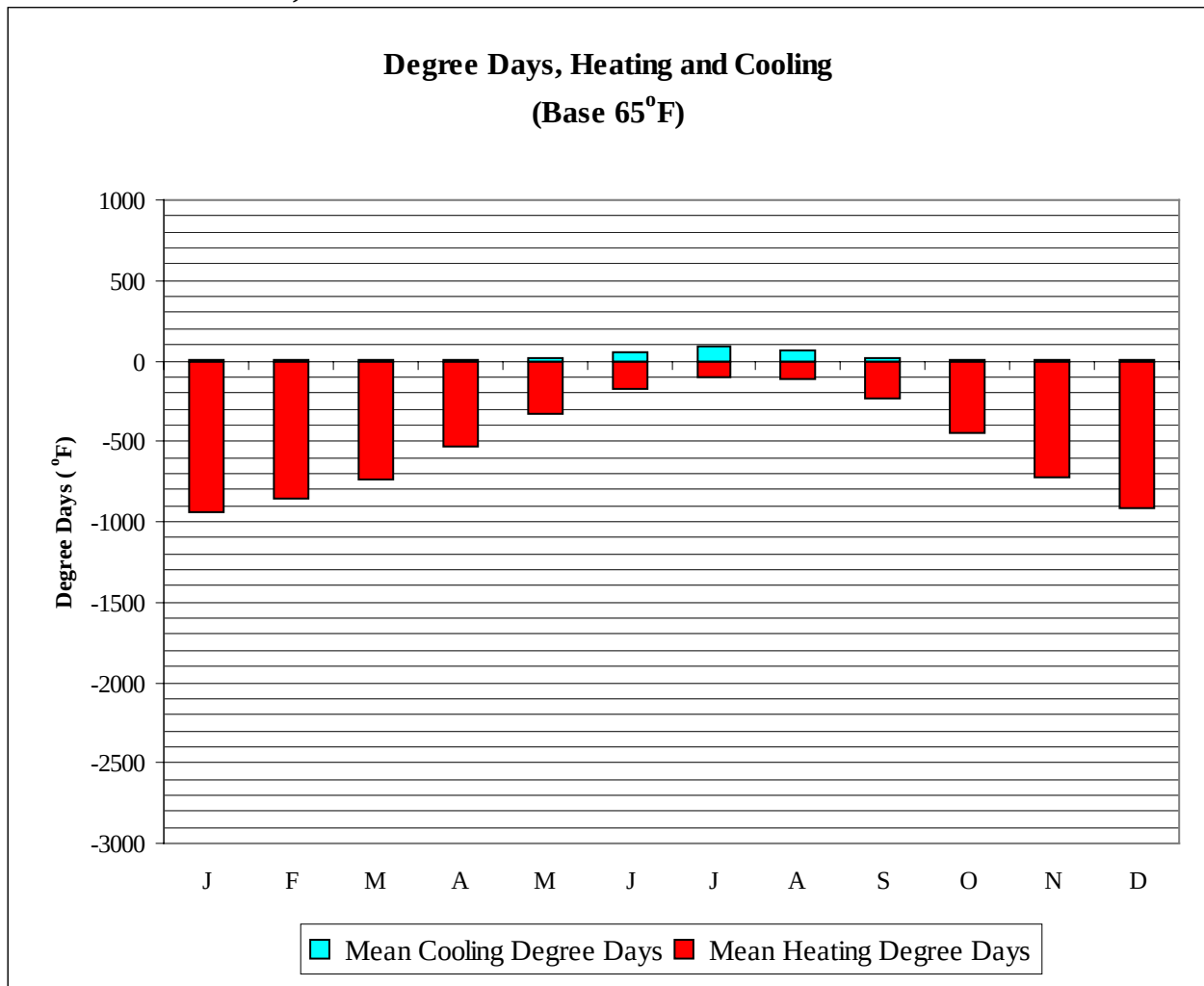


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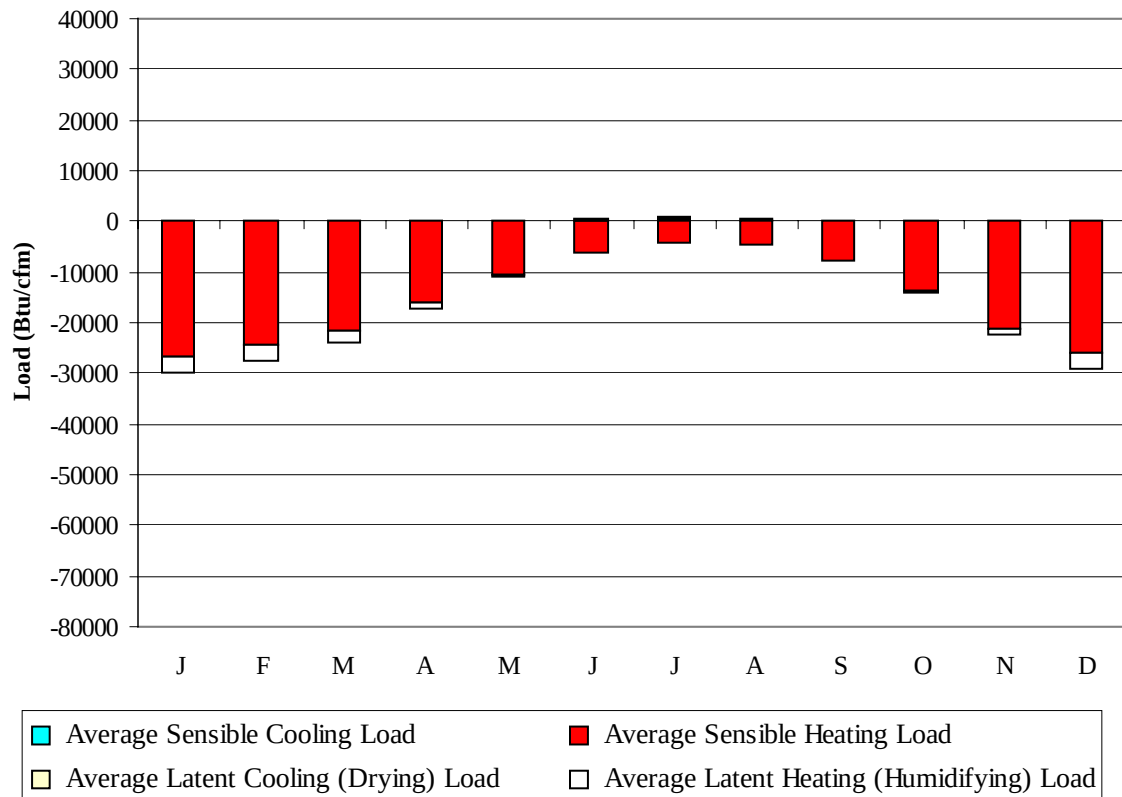
Long Term Dry Bulb Temperature and Humidity Summary

Week Ending	1.0% Temp (°F)	MCWB @ 1% Temp (°F)	Mean Max Temp (°F)	Mean Min Temp (°F)	99% Temp (°F)	1.0% HR (gr/lb)	MCDB @ 1% HR (°F)	Mean Max HR (gr/lb)	Mean Min HR (gr/lb)
7-Jan	48.0	46.4	36.2	30.2	10.0	49.0	47.7	29.1	22.0
14-Jan	50.0	47.2	35.1	28.1	7.0	48.3	49.0	27.4	20.5
21-Jan	48.0	45.3	35.5	28.9	9.0	48.3	48.1	27.1	20.4
28-Jan	48.0	45.4	37.9	31.7	16.0	47.6	46.9	30.2	23.1
4-Feb	50.0	45.2	38.4	30.5	11.0	46.2	46.4	29.2	21.7
11-Feb	52.0	47.0	38.9	30.9	14.0	49.0	48.6	29.9	21.6
18-Feb	48.0	44.0	37.4	28.4	14.0	45.5	46.9	26.9	19.2
25-Feb	55.0	48.8	40.4	30.4	14.0	51.8	52.7	28.3	20.5
4-Mar	54.0	46.5	42.2	31.6	18.0	48.3	48.1	29.7	21.2
11-Mar	57.0	48.9	45.2	33.5	20.0	48.3	51.3	31.3	22.8
18-Mar	61.0	49.4	46.8	35.8	25.0	50.4	49.4	35.1	25.3
25-Mar	63.0	53.2	48.3	36.7	27.0	55.3	58.7	36.2	26.3
1-Apr	68.0	53.3	50.3	38.1	28.0	56.0	55.3	38.2	27.8
8-Apr	64.0	51.3	51.2	38.3	30.0	52.5	52.4	36.8	26.6
15-Apr	66.0	52.6	52.7	38.4	28.0	55.3	58.8	37.9	26.6
22-Apr	70.0	55.1	56.5	41.2	31.0	59.5	59.1	41.2	29.3
29-Apr	70.0	57.6	55.4	41.6	32.0	60.2	58.2	42.7	31.1
6-May	73.0	59.7	58.8	44.1	35.0	67.2	66.5	48.8	35.7
13-May	77.0	60.6	61.4	45.9	37.0	72.8	64.1	51.7	37.0
20-May	77.0	61.0	64.4	47.9	37.0	79.8	61.0	55.4	39.6
27-May	77.0	61.6	63.5	48.4	40.0	72.8	66.5	54.5	40.3
3-Jun	79.0	65.1	65.3	50.2	41.0	86.1	69.0	58.2	43.3
10-Jun	79.0	64.2	66.9	51.6	43.0	84.0	69.3	63.8	47.6
17-Jun	82.0	66.1	68.6	52.8	45.0	94.5	73.3	66.1	49.2
24-Jun	81.0	65.3	68.8	53.5	46.0	100.1	75.9	69.1	52.4
1-Jul	88.0	68.0	69.9	54.6	46.0	100.8	76.7	71.0	53.0
8-Jul	86.0	67.0	71.4	55.9	46.0	100.1	76.7	71.7	54.8
15-Jul	86.0	67.1	72.7	56.3	49.0	94.5	76.1	75.3	56.0
22-Jul	88.0	68.9	71.5	56.2	48.0	99.4	78.4	72.1	55.1
29-Jul	88.0	71.3	73.2	56.4	50.0	107.1	80.0	73.4	55.5
5-Aug	88.0	66.5	74.9	57.8	49.0	94.5	79.0	76.9	58.1
12-Aug	84.0	66.7	71.8	55.9	48.0	94.5	73.2	75.1	57.0
19-Aug	84.0	68.3	72.7	56.3	48.0	100.8	76.0	78.1	57.9
26-Aug	84.0	69.9	70.3	54.6	48.0	95.2	73.1	71.3	53.6
2-Sep	81.0	68.3	69.1	53.1	46.0	94.5	74.4	68.8	51.7
9-Sep	81.0	64.7	67.0	52.6	45.0	88.9	68.6	68.3	50.8
16-Sep	77.0	63.7	66.5	51.3	44.0	88.2	71.1	66.6	49.1
23-Sep	79.0	65.7	64.6	50.1	41.0	94.5	71.7	65.7	48.4
30-Sep	73.0	62.5	62.9	48.3	41.0	83.3	68.4	61.3	44.9
7-Oct	73.0	62.4	60.6	49.0	39.0	79.8	70.9	59.7	45.8
14-Oct	71.0	61.0	57.7	46.1	36.0	74.2	62.8	54.7	41.9
21-Oct	66.0	59.4	55.7	43.6	33.0	72.8	63.3	50.9	37.8
28-Oct	68.0	58.2	53.0	42.1	31.0	69.3	57.9	46.8	35.4
4-Nov	61.0	54.6	49.3	39.9	27.0	63.7	58.0	42.6	32.4
11-Nov	59.0	54.4	47.0	37.8	28.0	63.0	57.3	39.4	29.6
18-Nov	57.0	50.7	44.7	36.5	25.0	57.4	52.7	37.8	28.0
25-Nov	54.0	49.5	42.6	35.1	21.0	53.2	53.2	34.8	26.4
2-Dec	52.0	48.3	40.1	32.6	19.0	49.7	48.2	31.9	23.9
9-Dec	54.0	47.7	39.2	31.9	19.0	48.3	48.9	30.7	23.4
16-Dec	52.0	47.5	38.1	31.3	16.0	49.7	50.3	30.7	22.6
23-Dec	54.0	52.1	37.7	31.4	14.0	56.0	51.6	30.9	23.1
31-Dec	52.0	49.0	36.9	31.1	12.0	49.7	49.5	29.8	23.0



	Mean Cooling Degree Days (°F)	Mean Heating Degree Days (°F)
JAN	0	936
FEB	0	853
MAR	0	738
APR	2	527
MAY	19	328
JUN	48	171
JUL	86	106
AUG	67	116
SEP	21	228
OCT	3	445
NOV	0	721
DEC	0	913
ANN	247	6082

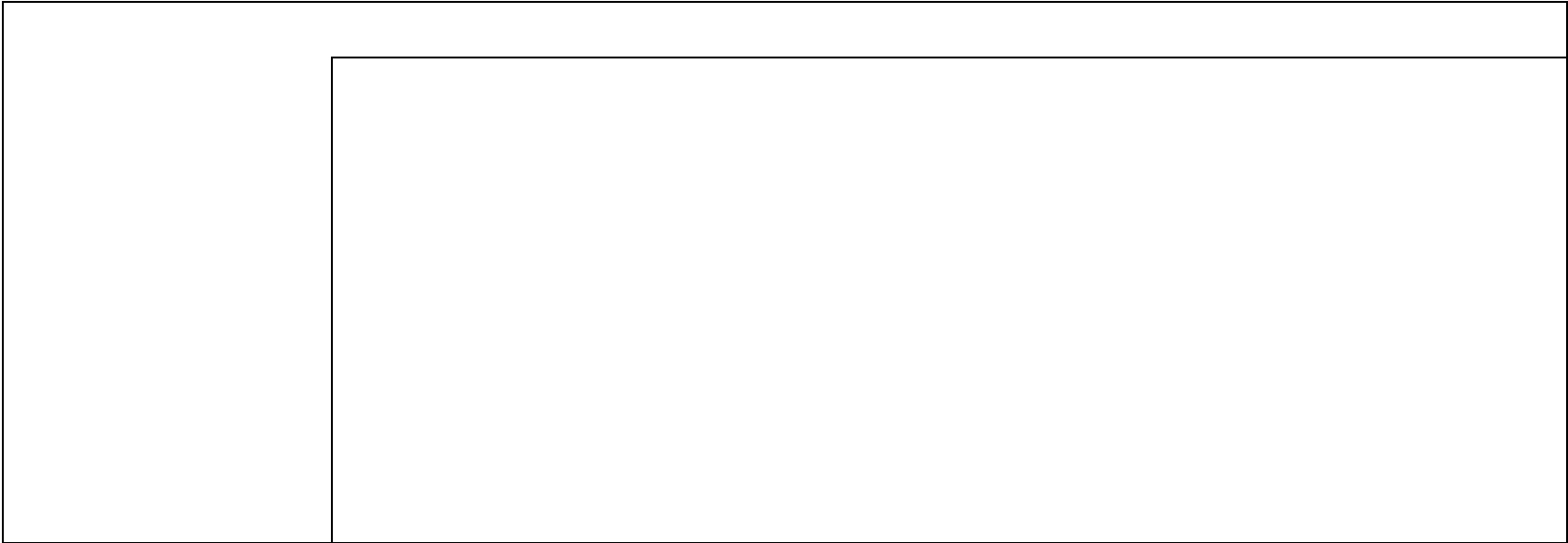
Average Ventilation and Infiltration Loads
(Outside Air vs. 75°F, 60% RH summer; 68°F, 30% RH winter)



	Average Sensible Cooling Load	Average Sensible Heating Load	Average Latent Cooling Load	Average Latent Heating Load
	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)	(Btu/cfm)
JAN	0	-26557	0	-3226
FEB	0	-24305	0	-3365
MAR	0	-21536	0	-2349
APR	0	-15928	0	-1272
MAY	31	-10665	10	-184
JUN	185	-6078	159	-25
JUL	500	-4110	333	0
AUG	329	-4569	299	0
SEP	36	-7892	96	-12
OCT	1	-13838	1	-242
NOV	0	-20988	0	-1503
DEC	0	-26020	0	-2909
ANN	1082	-182486	898	-15087

Average Annual Solar Radiation – Nearest Available Site
(Source: National Renewable Energy Laboratory, Golden CO, 1995)

No Solar Radiation
Data Available

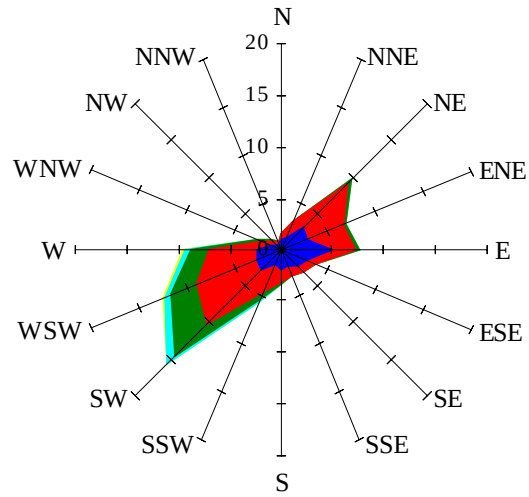


Average Annual Solar Heat and Illumination – Nearest Available Site

(Source: National Renewable Energy Laboratory, Golden CO, 1995)

Wind Summary - December, January, and February

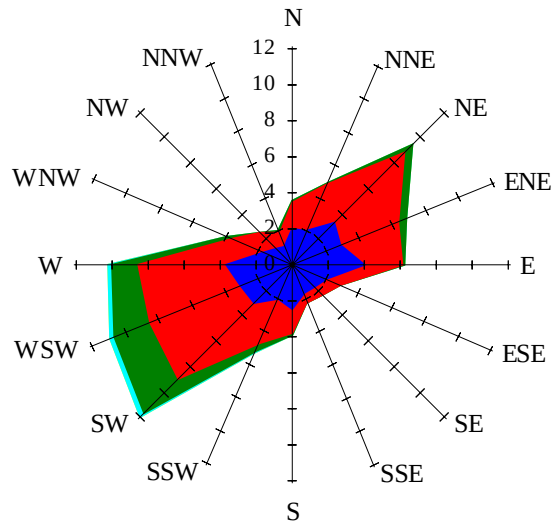
Labels of Percent Frequency on North Axis



Percent Calm = 11.36

Wind Summary - March, April, and May

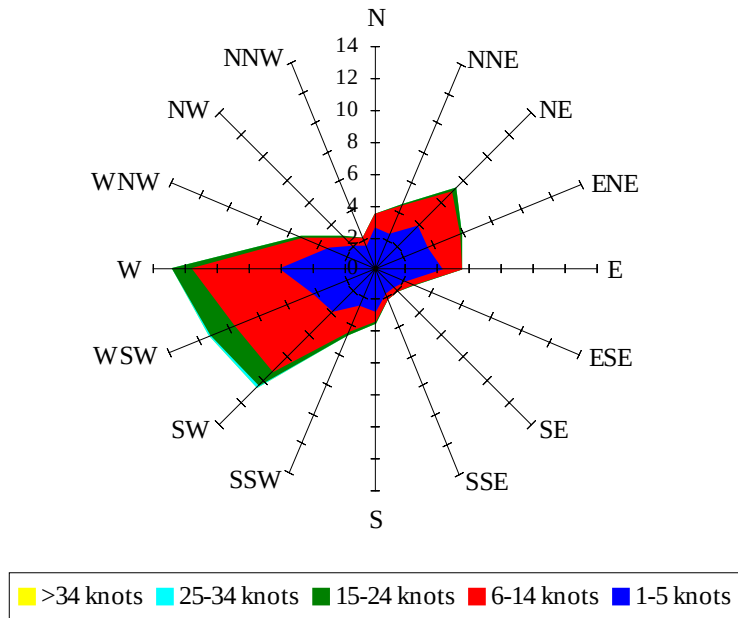
Labels of Percent Frequency on North Axis



Percent Calm = 11.56

Wind Summary - June, July, and August

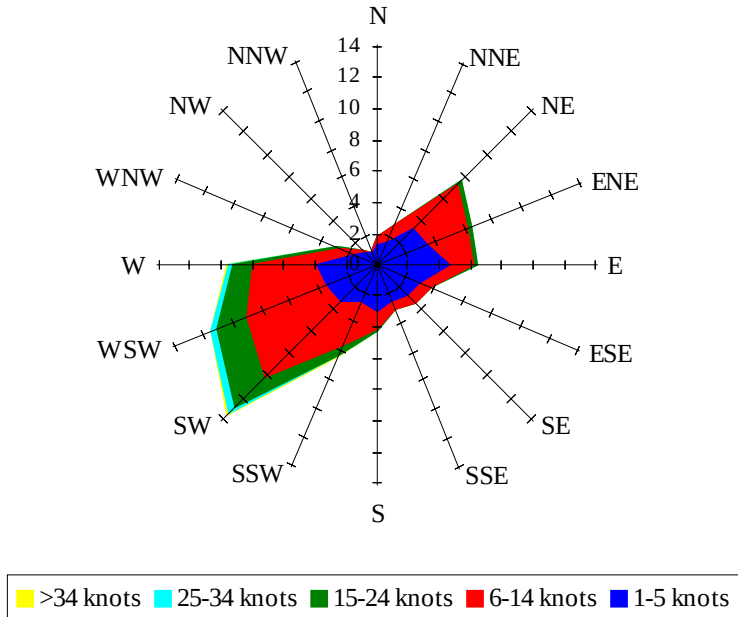
Labels of Percent Frequency on North Axis



Percent Calm = 15.17

Wind Summary - September, October, and November

Labels of Percent Frequency on North Axis



Percent Calm = 15.07